

Life Science

The Life Science standards emphasize a more complex understanding of change, cycles, patterns, and relationships in the living world. Students build on basic principles related to these concepts by exploring the cellular organization and the classification of organisms; the dynamic relationships among organisms, populations, communities and ecosystems; and change as a result of the transmission of genetic information from generation to generation. Inquiry skills at this level include organization and mathematical analysis of data, manipulating variables in experimentation, and identifying sources of experimental error.

- LS.1 The student will plan and conduct investigations in which
- data are organized into tables showing repeated trials and means;
 - variables are defined;
 - SI (metric) units are used;
 - criteria are established for evaluating a prediction;
 - models are constructed to illustrate and explain phenomena;
 - sources of experimental error are identified;
 - dependent variables, independent variables, and constants are identified;
 - variables are controlled to test hypotheses and trials are repeated;
 - continuous line graphs are constructed, interpreted, and used to make predictions; and
 - interpretations from the same set of data are evaluated and defended.
- LS.2 The student will investigate and understand that all living things are composed of cells. Key concepts include
- cell structure and organelles (cell membrane, cell wall, cytoplasm, vacuole, mitochondrion, endoplasmic reticulum, nucleus and chloroplast);
 - similarities and differences between plant and animal cells;
 - development of cell theory; and
 - cell division (mitosis and meiosis).
- LS.3 The student will investigate and understand that living things show patterns of cellular organization. Key concepts include
- cells, tissues, organs, and systems; and
 - functions and processes of cells, tissues, organs, and systems (respiration, removal of wastes, growth, reproduction, digestion, and cellular transport).
- LS.4 The student will investigate and understand that the basic needs of organisms must be met in order to carry out life processes. Key concepts include
- plant needs (light and energy sources, water, gases, nutrients);
 - animal needs (food, water, gases, shelter, space); and
 - factors that influence life processes.
- LS.5 The student will investigate and understand classification of organisms. Key concepts include
- differences in number, color, size, shape, and texture of external and internal structures; and
 - variation in method of locomotion, obtaining nourishment, and reproduction.
- LS.6 The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include
- energy transfer between sunlight and chlorophyll;
 - transformation of water and carbon dioxide into sugar, water, and oxygen; and
 - photosynthesis as the foundation of food webs.
- LS.7 The student will investigate and understand that organisms within an ecosystem are dependent on one another and on nonliving components of the environment. Key concepts include
- interactions resulting in a flow of energy and matter throughout the system;
 - complex relationships in terrestrial, freshwater, and marine ecosystems; and
 - energy flow in food chains, food webs, and food pyramids.
- LS.8 The student will investigate and understand that interactions exist among members of a population. Key concepts include
- competition, cooperation, social hierarchy, territorial imperative; and
 - influence of behavior on population interactions.
- LS.9 The student will investigate and understand interactions among populations in a biological community.

Key concepts include

- the relationship among producers, consumers, and decomposers in food chains and food webs;
- the relationship of predators and prey;
- competition and cooperation;
- symbiotic relationships and niches; and
- the role of parasites and their hosts.

LS.10 The student will investigate and understand how organisms adapt to biotic and abiotic factors in a biome.

Key concepts include

- differences between ecosystems and biomes;
- characteristics of land, marine, and freshwater biomes; and
- adaptations that enable organisms to survive within a specific biome.

LS.11 The student will investigate and understand that ecosystems, communities, populations, and organisms are dynamic and change over time (daily, seasonal, and long term). Key concepts include

- phototropism, hibernation, and dormancy;
- factors that increase or decrease population size; and
- eutrophication, climate change, and catastrophic disturbances.

LS.12 The student will investigate and understand the relationships between ecosystem dynamics and human activity. Key concepts include

- food production and harvest;
- change in habitat size, quality, and structure;
- change in species competition;
- population disturbances and factors that threaten and enhance species survival; and
- environmental issues (water supply, air quality, energy production, and waste management).

LS.13 The student will investigate and understand that organisms reproduce and transmit genetic information to new generations. Key concepts include

- the role of DNA;
- characteristics that can and cannot be inherited;
- genetic engineering and its applications; and
- historical contributions and significance of discoveries related to genetics.

LS.14 The student will investigate and understand that organisms change over time. Key concepts include

- the relationships of mutation, adaptation, natural selection, and extinction;
- evidence of evolution of different species in the fossil record; and
- how environmental influences, as well as genetic variation, can lead to diversity of organisms.